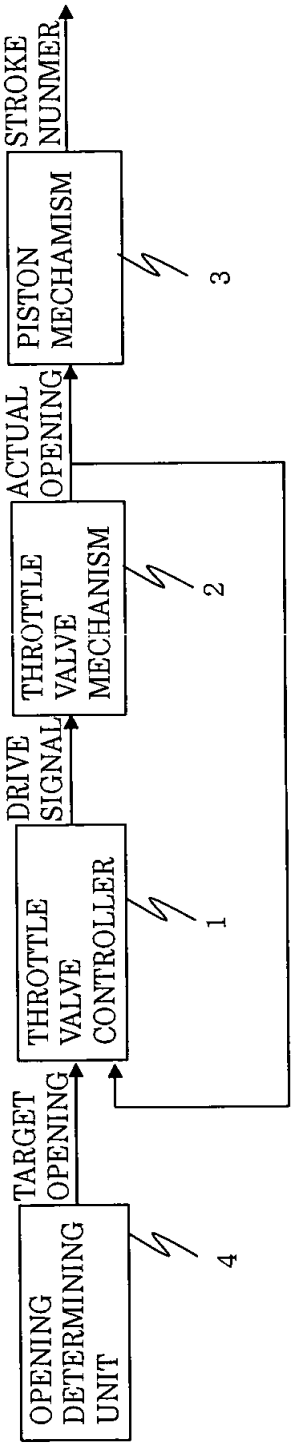

OPENING DETERMINING UNIT
4
TARGET OPENING
THROTTLE VALVE CONTROLLER
1
DRIVE SIGNAL
THROTTLE VALVE MECHANISM
2
ACTUAL OPENING
PISTON MECHAMISM
3
STROKE NUNMER

FIG.1

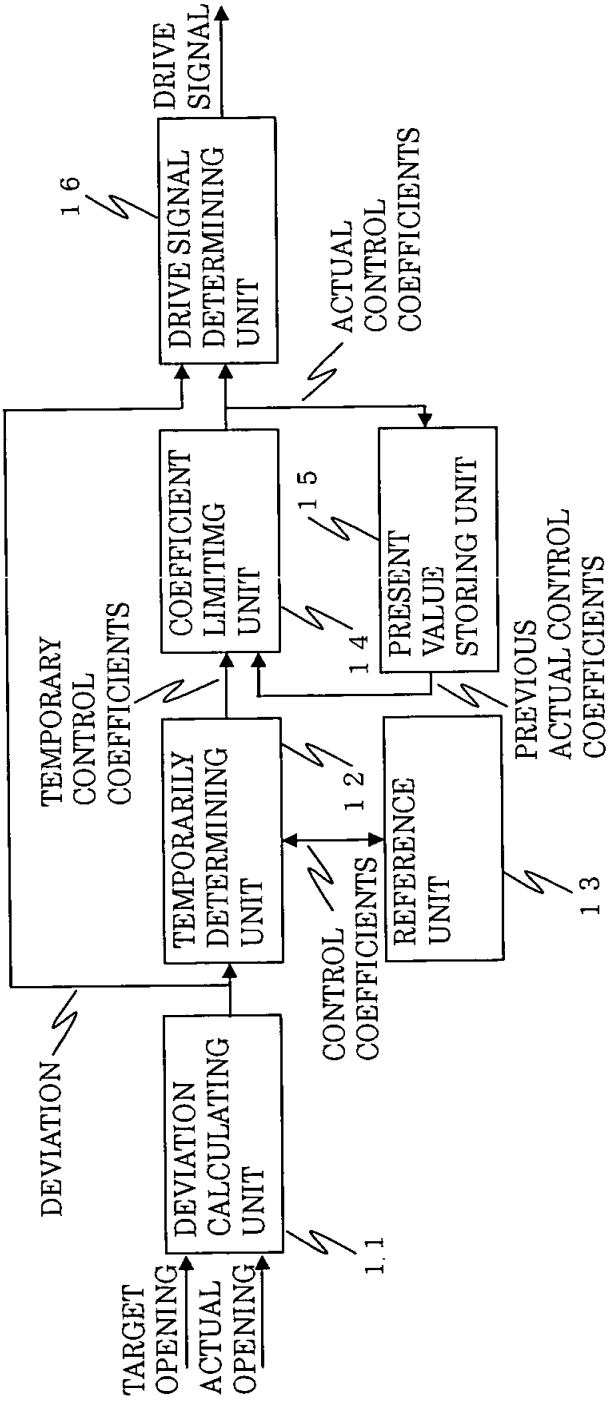
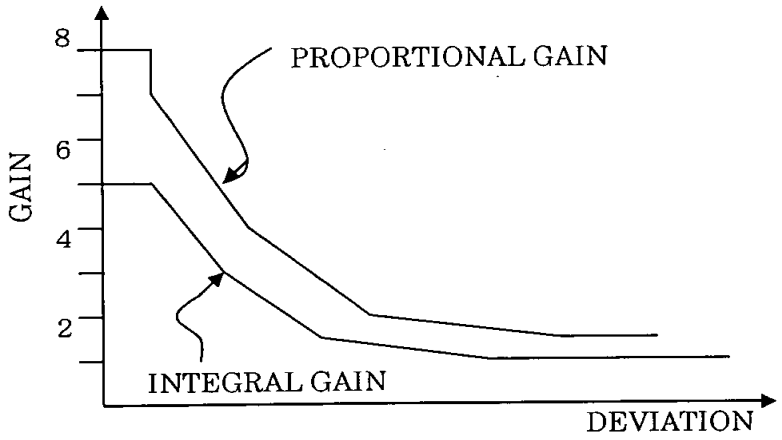

TARGET OPENING
ACTUAL OPENING
DEVIATION CALCULATING UNIT
11
DEVIATION
TEMPORARILY DETERMINING UNIT
12
CONTROL COEFFICIENTS
REFERENCE UNIT
13
PREVIOUS ACTUAL CONTROL COEFFICIENTS
TEMPORARY CONTROL COEFFICIENTS
COEFFICIENT LIMITIMG UNIT
14
15
PRESENT VALUE STORING UNIT
ACTUAL CONTROL COEFFICIENTS
16
DRIVE SIGNAL DETERMINING UNIT
DRIVE SIGNAL

FIG.2



DEVIATION= | ACTUAL OPENING−TARGET OPENING |

FIG. 3

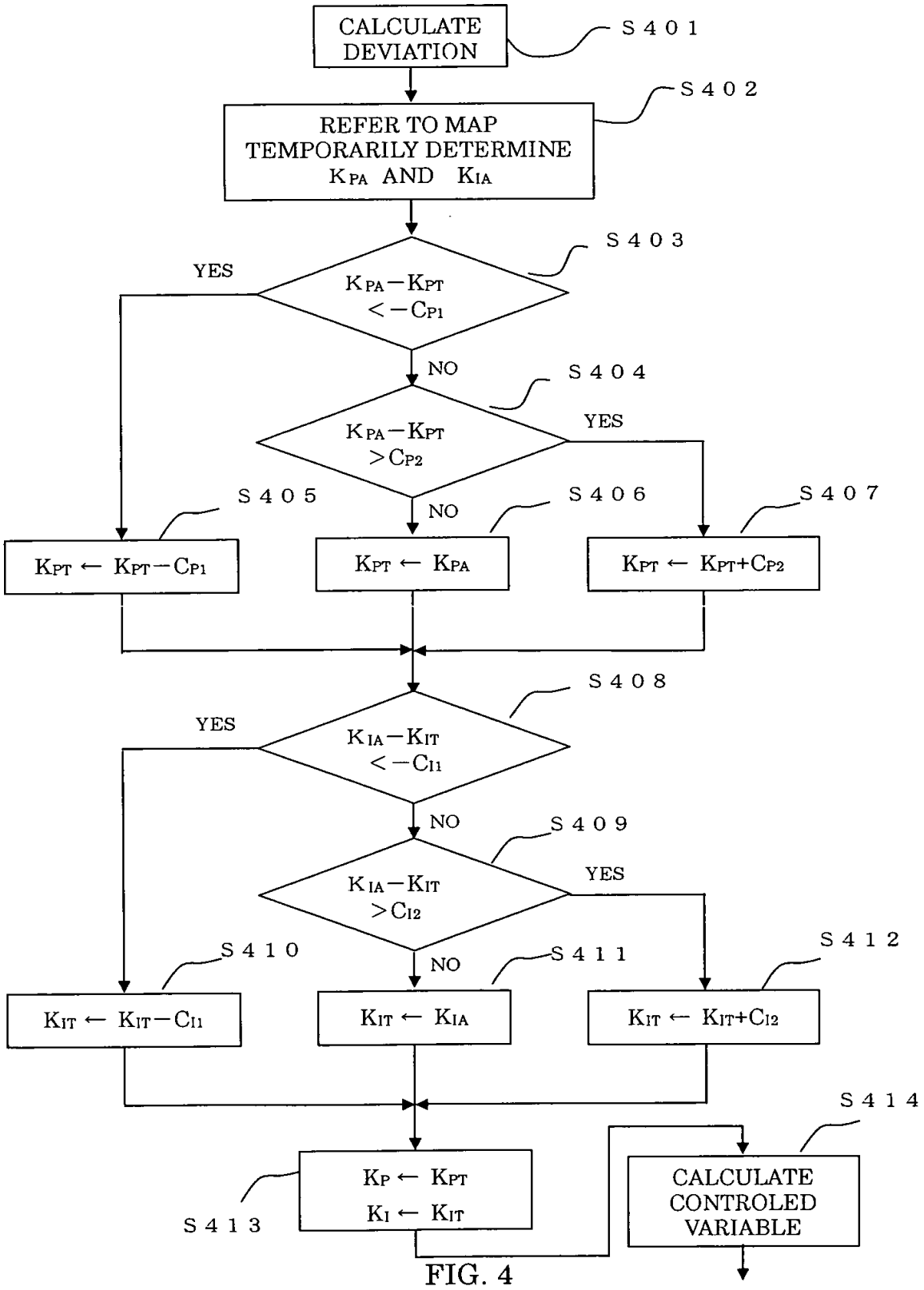

CALCULATE DEVIATION
S401
REFER TO MAP TEMPORARILY DETERMINE KPA AND KIA
S402
S403
KPA−KPT < −CP1
YES
NO
S404
KPA−KPT > CP2
YES
NO
S405
S406
S407
KPT ← KPT−CP1
KPT ← KPA
KPT ← KPT+CP2
S408
KIA−KIT < −CI1
YES
NO
S409
KIA−KIT > CI2
YES
NO
S410
S411
S412
KIT ← KIT−CI1
KIT ← KIA
KIT ← KIT+CI2
S413
KP ← KPT
KI ← KIT
S414
CALCULATE CONTROLED VARIABLE

FIG. 4

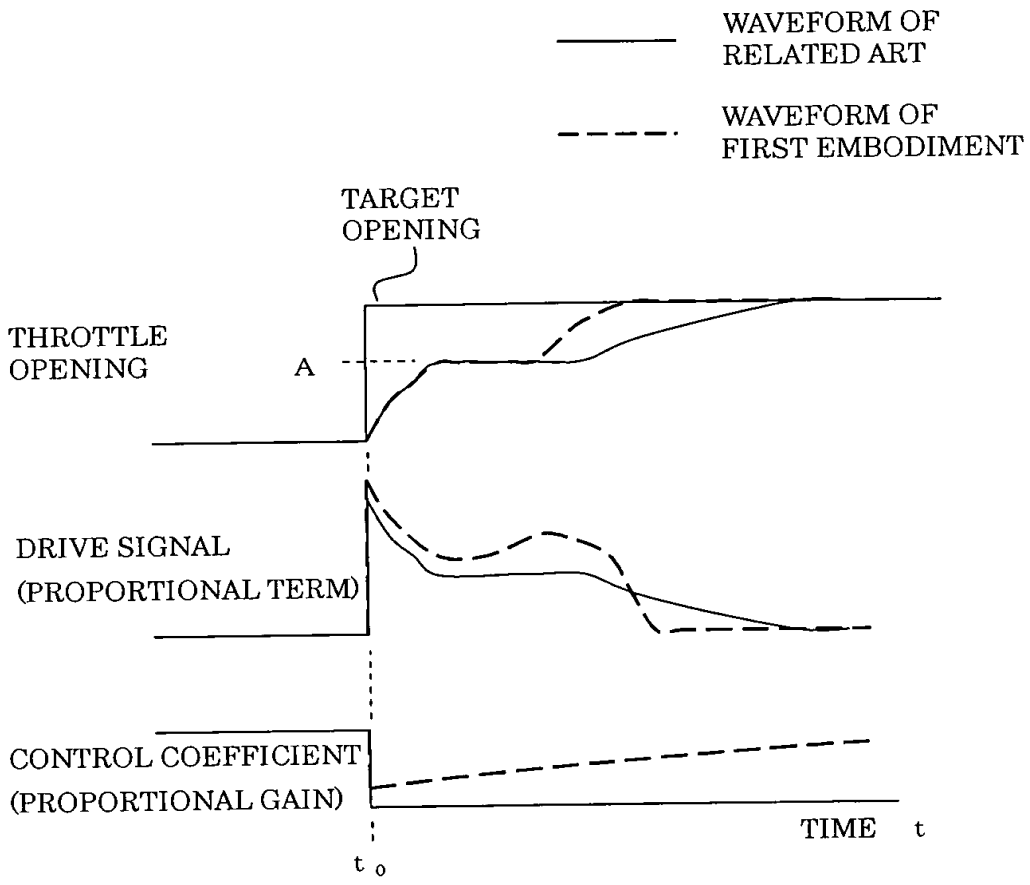

WAVEFORM OF RELATED ART
WAVEFORM OF FIRST EMBODIMENT
TARGET OPENING
THROTTLE OPENING
A
DRIVE SIGNAL (PROPORTIONAL TERM)
CONTROL COEFFICIENT (PROPORTIONAL GAIN)
TIME t
t o

FIG. 5

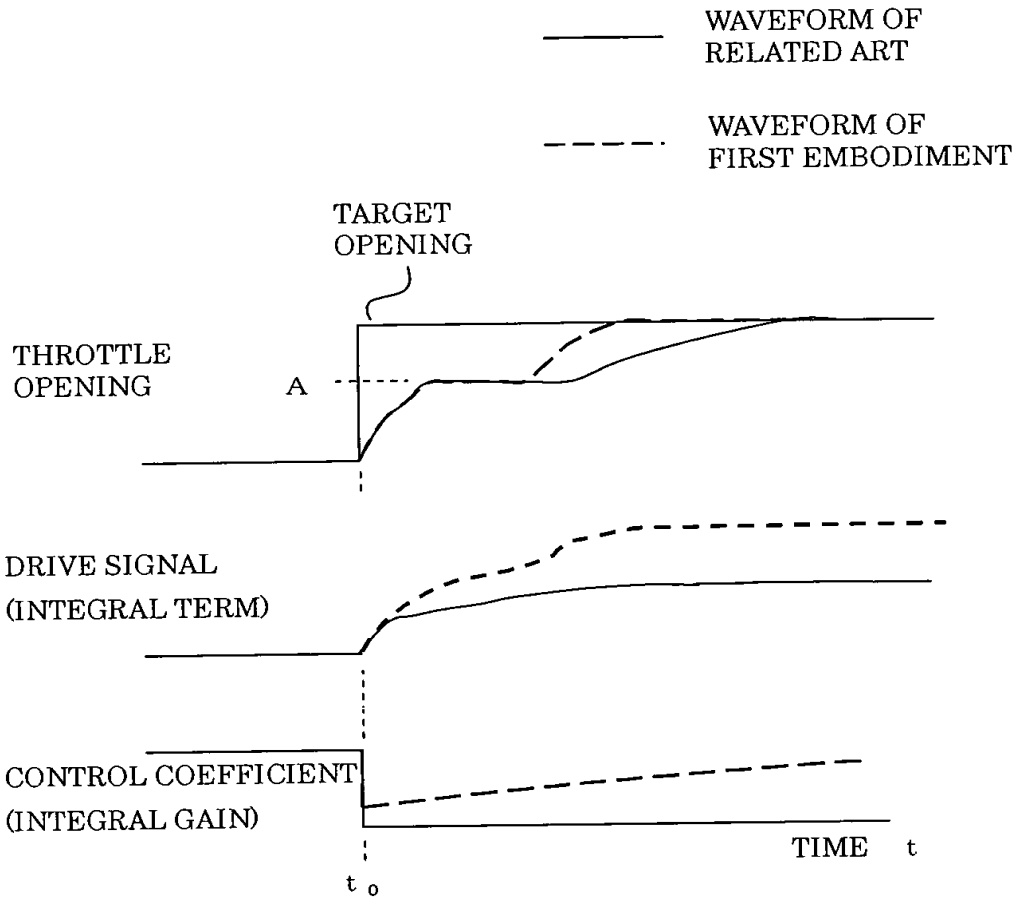

WAVEFORM OF RELATED ART
WAVEFORM OF FIRST EMBODIMENT
TARGET OPENING
THROTTLE OPENING
A
DRIVE SIGNAL (INTEGRAL TERM)
CONTROL COEFFICIENT (INTEGRAL GAIN)
TIME t
t o

FIG. 6

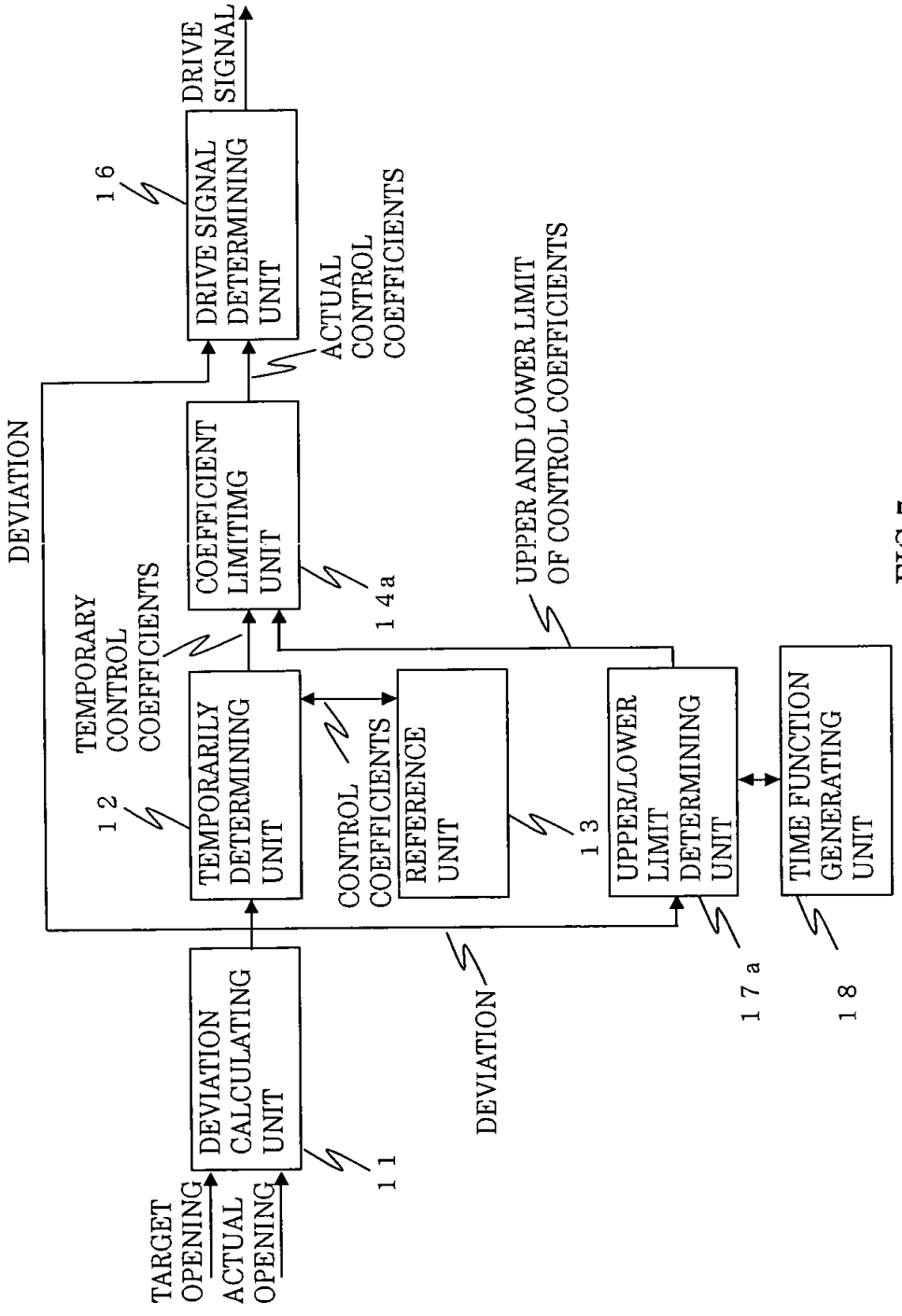
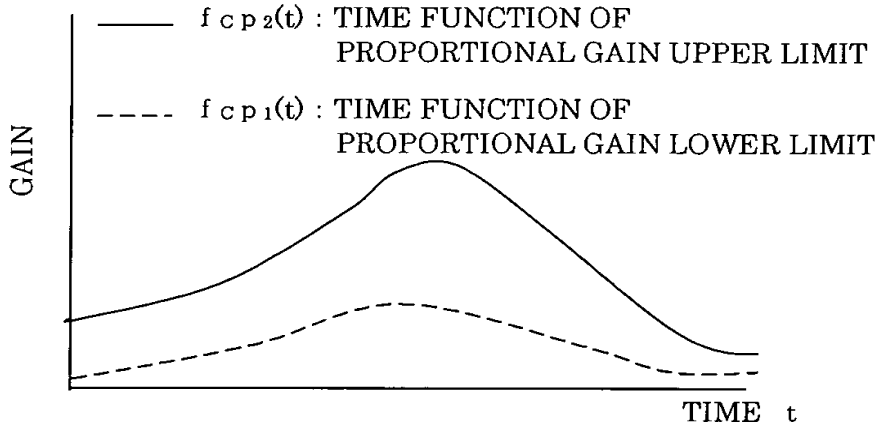
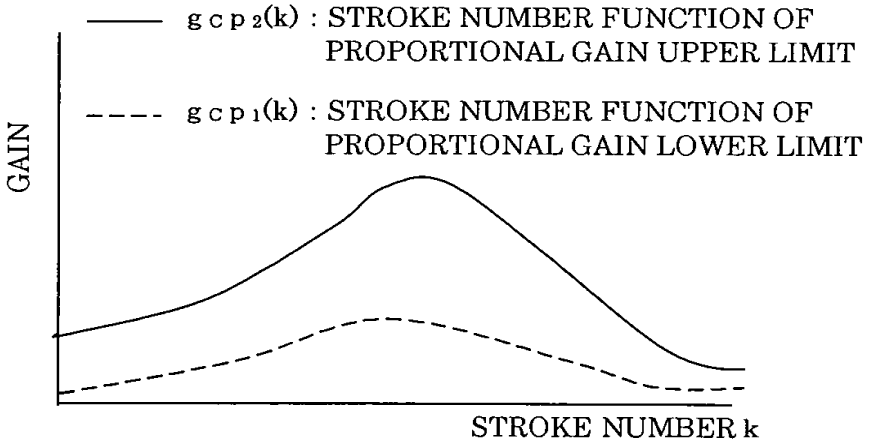

TARGET OPENING
ACTUAL OPENING
DEVIATION CALCULATING UNIT
11
DEVIATION
DEVIATION
TEMPORARILY DETERMINING UNIT
12
TEMPORARY CONTROL COEFFICIENTS
CONTROL COEFFICIENTS
REFERENCE UNIT
13
COEFFICIENT LIMITIMG UNIT
14a
ACTUAL CONTROL COEFFICIENTS
UPPER AND LOWER LIMIT OF CONTROL COEFFICIENTS
UPPER/LOWER LIMIT DETERMINING UNIT
17a
TIME FUNCTION GENERATING UNIT
18
DRIVE SIGNAL DETERMINING UNIT
16
DRIVE SIGNAL

FIG.7



(TIME AFTER DEVIATION EXCEEDS CERTAIN VALUE)

FIG.8


gcp2(k) : STROKE NUMBER FUNCTION OF
PROPORTIONAL GAIN UPPER LIMIT
gcp1(k) : STROKE NUMBER FUNCTION OF
PROPORTIONAL GAIN LOWER LIMIT
GAIN
STROKE NUMBER k

(STROKE NUMBER AFTER DEVIATION EXCEEDS CERTAIN VALUE)

FIG.11

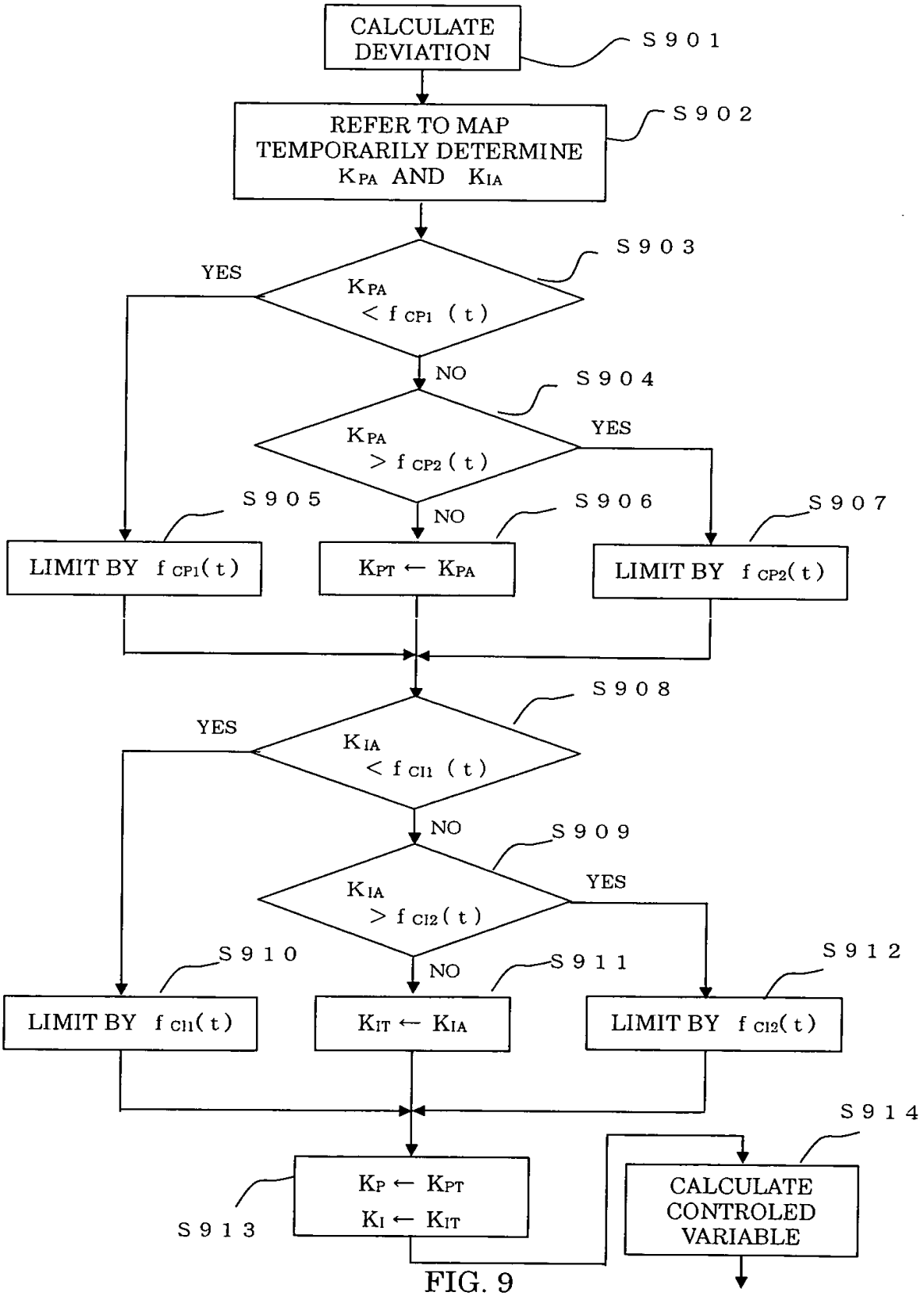

CALCULATE DEVIATION
S901
REFER TO MAP TEMPORARILY DETERMINE K_{PA} AND K_{IA}
S902
S903
YES
$K_{PA} < f_{CP1}(t)$
NO
S904
$K_{PA} > f_{CP2}(t)$
YES
NO
S905
S906
S907
LIMIT BY $f_{CP1}(t)$
$K_{PT} \leftarrow K_{PA}$
LIMIT BY $f_{CP2}(t)$
S908
YES
$K_{IA} < f_{CI1}(t)$
NO
S909
$K_{IA} > f_{CI2}(t)$
YES
NO
S910
S911
S912
LIMIT BY $f_{CI1}(t)$
$K_{IT} \leftarrow K_{IA}$
LIMIT BY $f_{CI2}(t)$
S914
S913
$K_P \leftarrow K_{PT}$
$K_I \leftarrow K_{IT}$
CALCULATE CONTROLED VARIABLE

FIG. 9

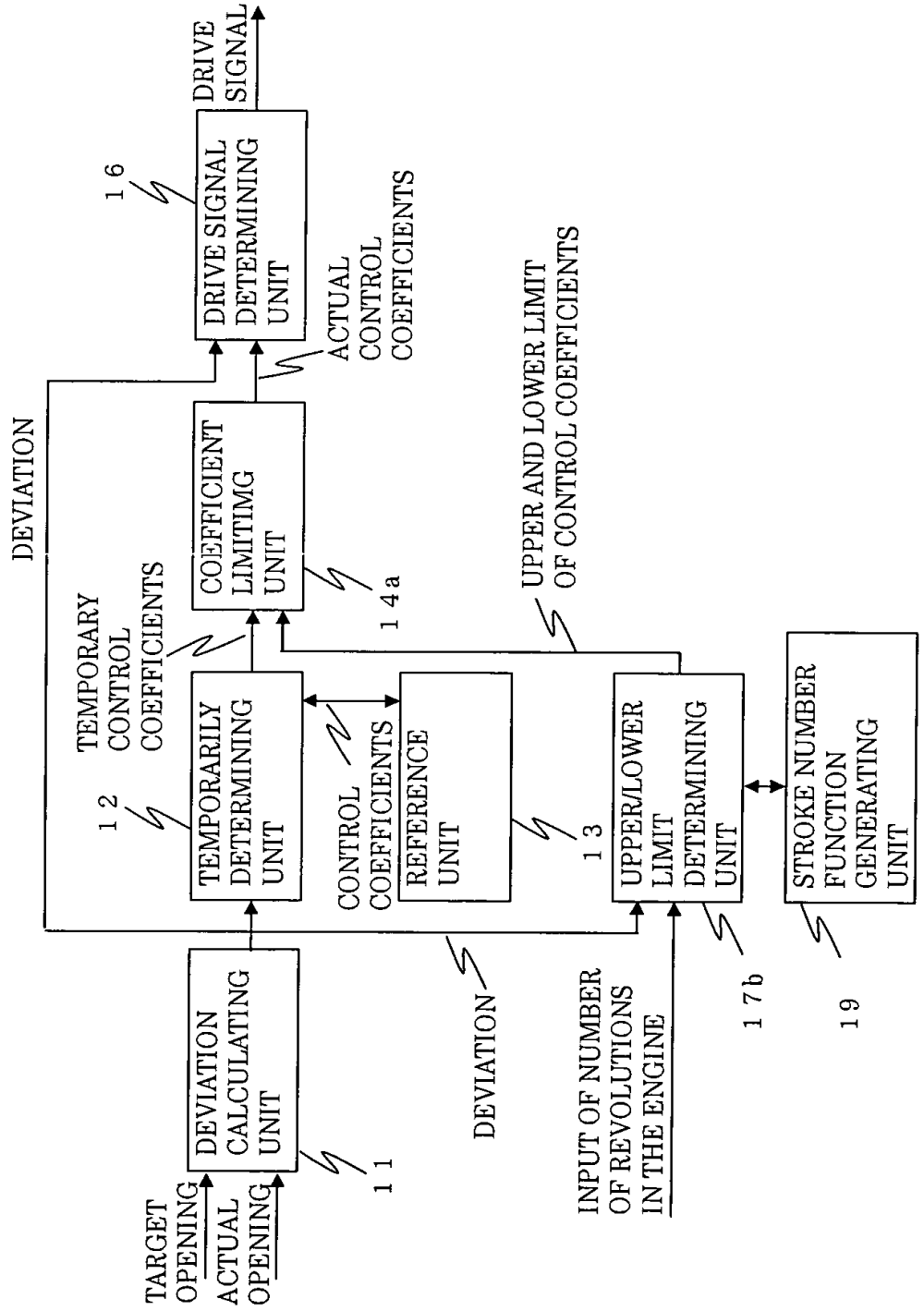

TARGET OPENING
ACTUAL OPENING
DEVIATION CALCULATING UNIT
11
DEVIATION
INPUT OF NUMBER OF REVOLUTIONS IN THE ENGINE
17b
19
STROKE NUMBER FUNCTION GENERATING UNIT
UPPER/LOWER LIMIT DETERMINING UNIT
13
REFERENCE UNIT
CONTROL COEFFICIENTS
TEMPORARILY DETERMINING UNIT
12
TEMPORARY CONTROL COEFFICIENTS
DEVIATION
COEFFICIENT LIMITIMG UNIT
14a
UPPER AND LOWER LIMIT OF CONTROL COEFFICIENTS
ACTUAL CONTROL COEFFICIENTS
DRIVE SIGNAL DETERMINING UNIT
16
DRIVE SIGNAL

FIG.10

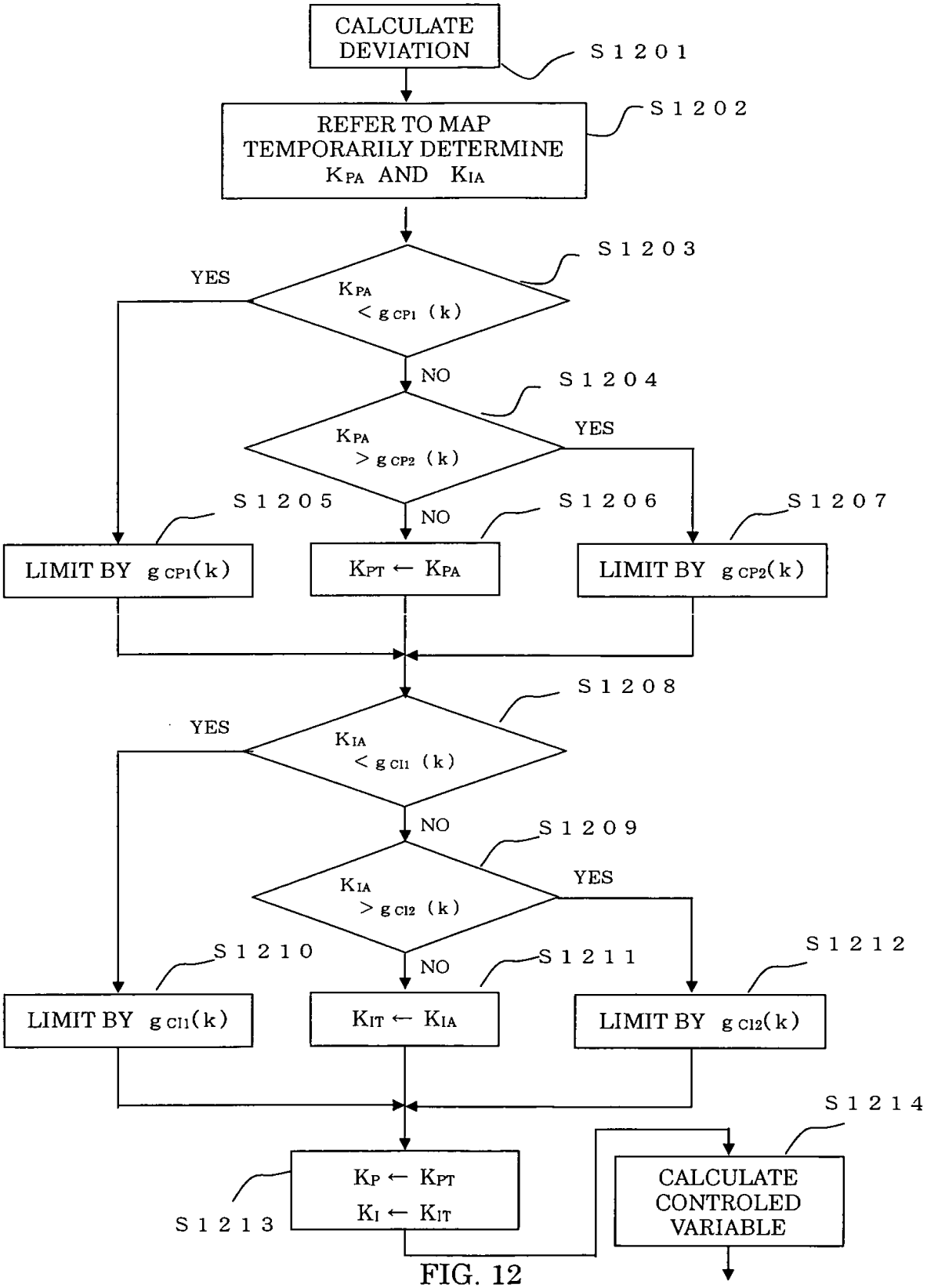

CALCULATE DEVIATION
S 1 2 0 1
REFER TO MAP TEMPORARILY DETERMINE K_{PA} AND K_{IA}
S 1 2 0 2
S 1 2 0 3
YES
$K_{PA} < g_{CP1}(k)$
NO
S 1 2 0 4
$K_{PA} > g_{CP2}(k)$
YES
S 1 2 0 5
S 1 2 0 6
S 1 2 0 7
NO
LIMIT BY $g_{CP1}(k)$
$K_{PT} \leftarrow K_{PA}$
LIMIT BY $g_{CP2}(k)$
S 1 2 0 8
YES
$K_{IA} < g_{CI1}(k)$
NO
S 1 2 0 9
$K_{IA} > g_{CI2}(k)$
YES
S 1 2 1 0
S 1 2 1 1
S 1 2 1 2
NO
LIMIT BY $g_{CI1}(k)$
$K_{IT} \leftarrow K_{IA}$
LIMIT BY $g_{CI2}(k)$
S 1 2 1 4
S 1 2 1 3
$K_P \leftarrow K_{PT}$
$K_I \leftarrow K_{IT}$
CALCULATE CONTROLED VARIABLE

FIG. 12